

SEEDS OF SOME UNITED STATES PHYTOLACCACEAE AND AIZOACEAE

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Some years ago I embarked on a project that, hopefully, was to result in the production of a seed atlas of the genera of the United States flora. The plan was to characterize the seeds of each genus by describing and illustrating the seeds of one or more species chosen as typical. The Centrospermae were chosen as the starting place for the project—which soon came to an abrupt end as promised financial aid for the illustrations was not forthcoming. The project's main distinction, then, is that it was the shortest long-range endeavor in New World botanical history. The superb illustrations included in the present paper are the major results of the project; they are the work of Samuel H. Grove, Jr., who currently is drawing ticks in Egypt.

Realistic illustrations and accurate detailed descriptions of the gross external morphology of seeds are all too uncommon. Illustrations and descriptions of seeds of weedy plants are much more frequently encountered than are those of seeds of other plants. In only one publication known to me—the *Zadenatlas der Nederlandsche Flora*, which appeared in 1947—are *all* the seeds of a political area illustrated. Certain floras contain brief descriptions and occasional illustrations of seeds, but by far most of them present no more than descriptions. The descriptions range from quite inadequate—even ridiculous—to excellent, the latter case being singularly uncommon. In monographic treatments of various taxa, seeds may be treated in some detail or, more likely, essentially neglected.

Illustrations and descriptions of seeds have, of course, a practical value as an aid in seed identification. Of more fundamental significance, however, is the possible systematic application of data derived from studies of gross external morphology of seeds. Of seeds and systematics Buxbaum (1951) had this to say.

“Es ist eigentlich unglaublich, wie wenig in der Systematik auf den äusseren Bau der Samen geachtet wurde. Bearbeitet wurde meist nur Vorhandsein oder Fehlen, sowie die Beschaffenheit des Endospermes und die Gestalt und Lage des Embryo. Die äussere Gestalt und Textur der Testa wird fast immer arg vernachlässigt. Und doch können von ihr wichtige Aufschlüsse sowohl in Bezug auf die innere Gliederung einer Familie, als auch in Fragen der höheren Kategorien der Klärung nähergebracht werden.”

This neglect of seeds is most incongruous, especially, perhaps, because seeds are the characteristic structure of the taxon called the "seed plants." The characters of vegetative and floral structure have always occupied a position of prominence with the systematic botanist, but those of seeds have been little used. The seed, like any other plant part, may have potential value. The systematist can discover, only through detailed study, those taxa in which seeds might be useful in the solution of problems of classification. Few such studies have been made.

The present paper is intended as a contribution to descriptive literature on seeds. Presented here are illustrations and descriptions of seeds chosen to typify seven genera of Centrospermae as represented in the United States: *Rivina* and *Phytolacca* of the Phytolaccaceae; and *Molugo*, *Glinus*, *Cypselea*, *Trianthema*, and *Sesuvium* of the Aizoaceae. Seeds for study were obtained from herbarium specimens (from three herbaria: LAF, SMU, and F) and from collections made by me. Each pair of illustrations is a portrait of *one* seed chosen as representative; they are *not* composite drawings. The descriptions were composed after study of seeds from at least ten different collections, of the widest possible geographic distribution within the United States. When compared with the illustrations, they serve well to emphasize that existing terminology for seed description is rather inadequate. Terminology followed in this paper is, at least largely, that of Murley (1951). The figures given for length and width are of these dimensions as seen in lateral view of the seed. In the illustrations, the left drawing is of a lateral view, and the right drawing is of a ventral view. Order of presentation of taxa is that of Wilson (1932).

PHYTOLACCACEAE

RIVINA

1. *Rivina humilis* L.

Fig. 1 (top)

Fruit 1-seeded. Seed length 2.2-2.4 mm., width 2.2-2.4 mm.; shape orbicular to orbicular-oval in lateral view, oval to ellipsoid in ventral view; testa black but densely covered with short (0.17-0.20 mm.), septate, occasionally branched, nearly colorless to pale brown hairs; testa minutely rugulose to almost smooth; hilum prominent.

PHYTOLACCA

1. *Phytolacca americana* L.

Fig. 1 (bottom)

Fruit 7-11 seeded, usually 10. Seed length 2.6-3.1 mm., width 2.2-2.8 mm.; shape hemioval to oval or even orbicular in lateral view, narrowly oval to ellipsoid in ventral view; color black, highly glossy, hilar peg yellowish white; testa smooth; hilar depression prominent.

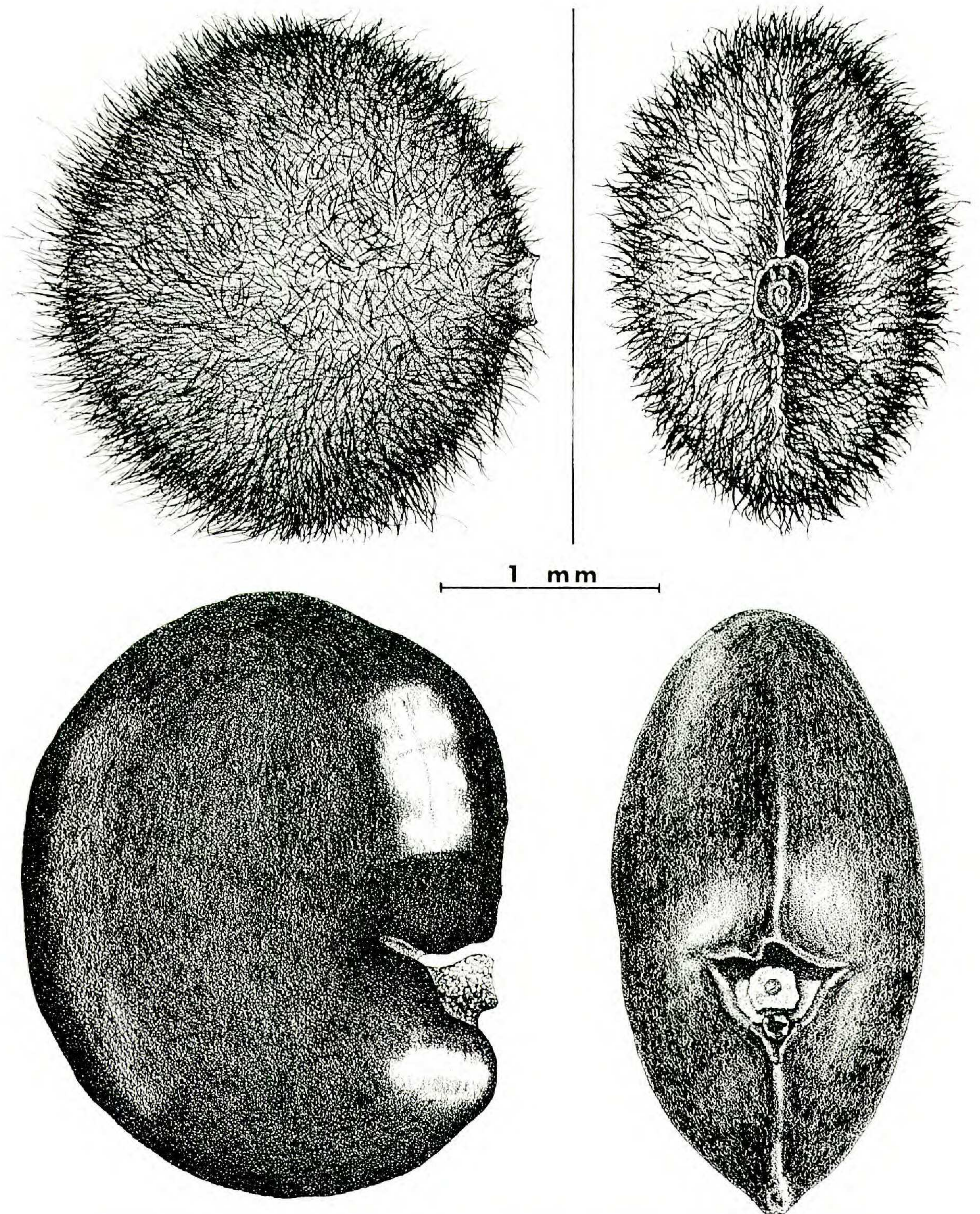


Fig. 1. *Rivina humilis* (top), *Phytolacca americana* (bottom).

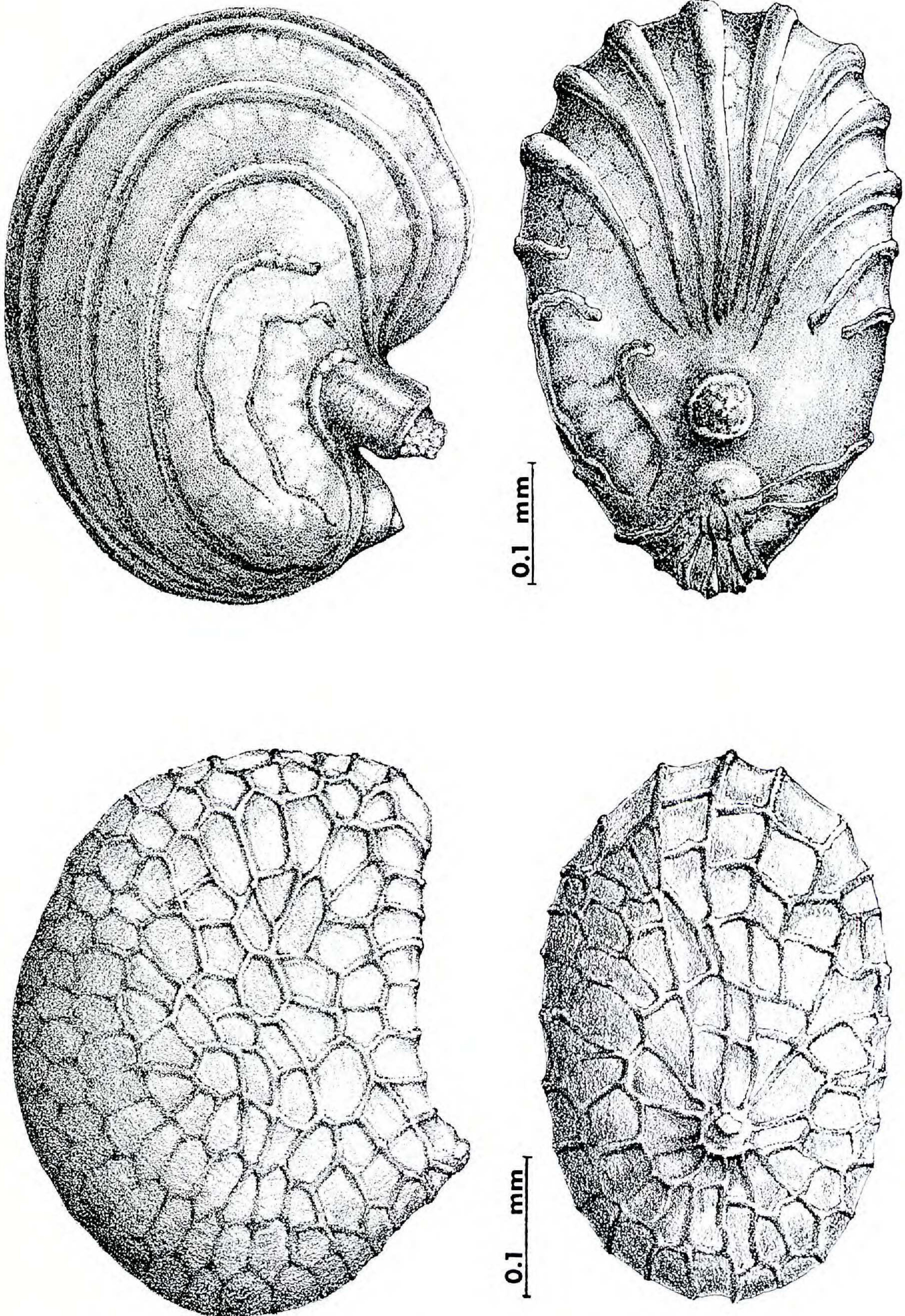


Fig. 2. *Mollugo verticillata* (top), *M. cerviana* (bottom).

AIZOACEAE

MOLLUGO

1. *Mollugo verticillata* L.

Fig. 2 (top)

Fruit many seeded. Seed length 0.5-0.6 mm., width 0.4-0.5 mm.; shape asymmetrically reniform in lateral view, oval to somewhat ovoid in ventral view; color orange brown, highly glossy; testa smooth to strongly ribbed (see text below); hilar peg and hilar depression prominent; micropyle prominent.

The seeds of *Mollugo verticillata* are more variable than any others examined during the preparation of this paper. It is true, of course, that all the seeds studied showed a certain amount of variation in shape and size that appears to depend not so much on genetics (i.e., variation from individual to individual) as on the physical factors of position within the fruit and number of seeds maturing within the fruit. *Mollugo verticillata* seeds show such variation in shape and size, but they also show remarkable variation in sculpturing of the testa. Figure 2 (top) shows a *M. verticillata* seed with the maximum amount of ribbing that I have seen in this species. At the other extreme are those seeds without any ribbing at all but with entirely smooth testae. Between these extremes can be found every intermediate. Thus, seeds may have only one rib—this centrally on the dorsal surface. Increase in number of ribs takes place through development of a more or less equal number of additional ribs on either side of the central dorsal one, i.e., a three-ribbed seed has one rib on each side of the dorsal one, a five-ribbed seed has two ribs on each side of the dorsal one, etc.

I carried out mass collection studies of *M. verticillata* seeds to investigate possible causes of variation in sculpturing of the testa. From these studies I have concluded that position of seed within the fruit, position of fruit on the plant, number of seeds maturing within the fruit, and time of ripening of fruit (all of which *can* affect testa characteristics in some species) have little to do with these characteristics in *M. verticillata*. For the most part, the testae of all seeds borne by a single plant, and by all plants in a local population, are more often less similar in sculpturing. Thus of ten populations (separated from each other by at least ½ mile) studied by me in Lake, Porter, and La Porte counties, Indiana, six had smooth seeds, three had moderately ribbed seeds, and one had seeds with the maximum amount of ribbing (and was the source of the seed illustrated in Fig. 2 [top]). It can probably be safely concluded, therefore, that testa variation in *M. verticillata* is largely genetically controlled.

2. *Mollugo cerviana* (L.) Ser. in DC.

Fig. 2 (bottom)

Fruit many seeded. Seed length 0.3-0.4 mm., width 0.3-0.4 mm.; shape asymmetrically hemioval in lateral view, oval to ellipsoid in ventral view; color orange brown; testa finely reticulate, the reticulations ir-

regular in the central area of the lateral surfaces of the seed, becoming more or less scalariform on the dorsal surface and around the periphery of the lateral surfaces; hilum prominent.

GLINUS

1. *Glinus lotoides* L.

Fig. 3 (top)

Fruit many seeded. Seeds strophiolate and with a persistent, long slender funiculus. Seed length 0.4-0.6 mm., width 0.3-0.4 mm.; shape reniform (often asymmetrically so) in a lateral view, oblong to ovoid in ventral view; color of testa light to dark orange brown, highly glossy, of strophiole and funiculus white to yellow white; testa minutely tuberculate, strophiole obscurely reticulate; hilar depression shallow.

Seeds of the other species of *Glinus* in the United States, *G. radiatus* (Ruiz et Pavon) Rohrb., are similar in aspect to those of *G. lotoides*. They differ, however, in being somewhat smaller (length 0.4-0.5 mm., width 0.25-0.30 mm.) and in having a *smooth* testa. The seeds provide an easy means to distinguish these two species.

CYPSELEA

1. *Cypselea humifusa* Turp.

Fig. 3 (bottom)

Fruit many seeded. Seed length 0.30-0.35 mm., width 0.20-0.25 mm.; shape reniform (often asymmetrically so) in lateral view, oval-ellipsoid in ventral view; color of testa brown to yellow brown, somewhat glossy; hilar area prominent, spongy, dull white, or not at all differentiated; testa very finely and obscurely reticulate; hilar depression shallow; hilar peg present or absent.

TRIANTHEMA

Fig. 4 (top)

1. *Trianthema portulacastrum* L.

Fruit 3-10 seeded, with 1 or 2 of these seeds contained in the indehiscent apical portion. Seed length 1.5-2.0 mm., width 1.4-1.6 mm.; shape orbicular to reniform in lateral view, ellipsoid to oblong in ventral view; color brown black to black, slightly glossy; testa strongly rugose, the wrinkles low and rounded to steep-sided and angular at the summit; hilar depression prominent to almost lacking; hilar peg usually present, whitish.

The one or two seeds contained in the indehiscent apical "cap" of the fruit are usually slightly larger than those contained in the lower portion; they are also more nearly orbicular. Here, then, is a good example of the effect, on seed size and shape, of position in the fruit.

SESUVIUM

1. *Sesuvium portulacastrum* (L.) L.

Fig. 4 (bottom)

Fruit many seeded. Seed length 1.0-1.5 mm., width 0.9-1.3 mm.; shape reniform (often asymmetrically so) to obtusely triangular in lateral view, oval-ellipsoid in ventral view; outermost layer of testa 1 cell thick, persistent or, at least in part, sloughing off, this layer nearly colorless, the testa below this layer brown black or black, glossy; testa nearly

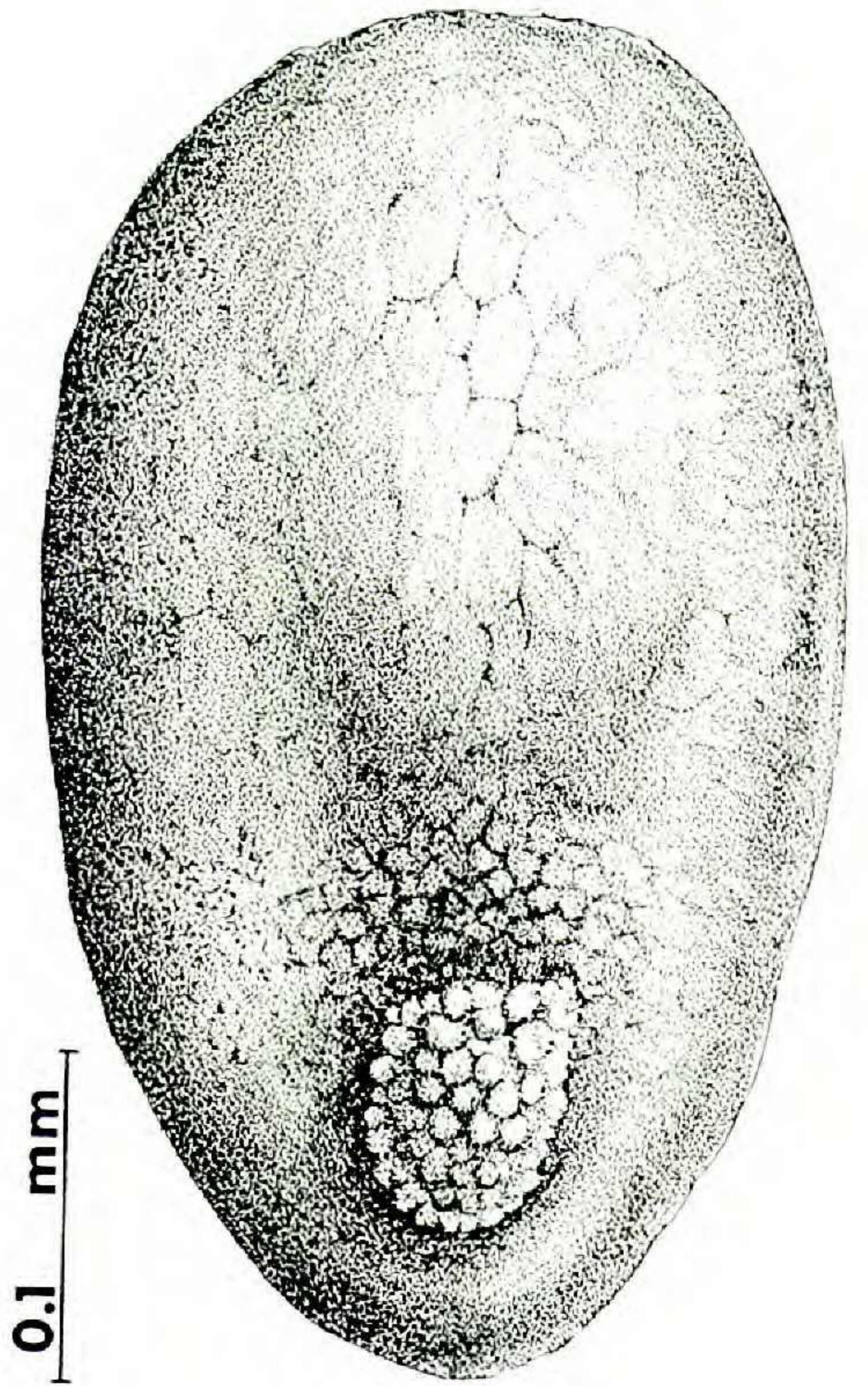
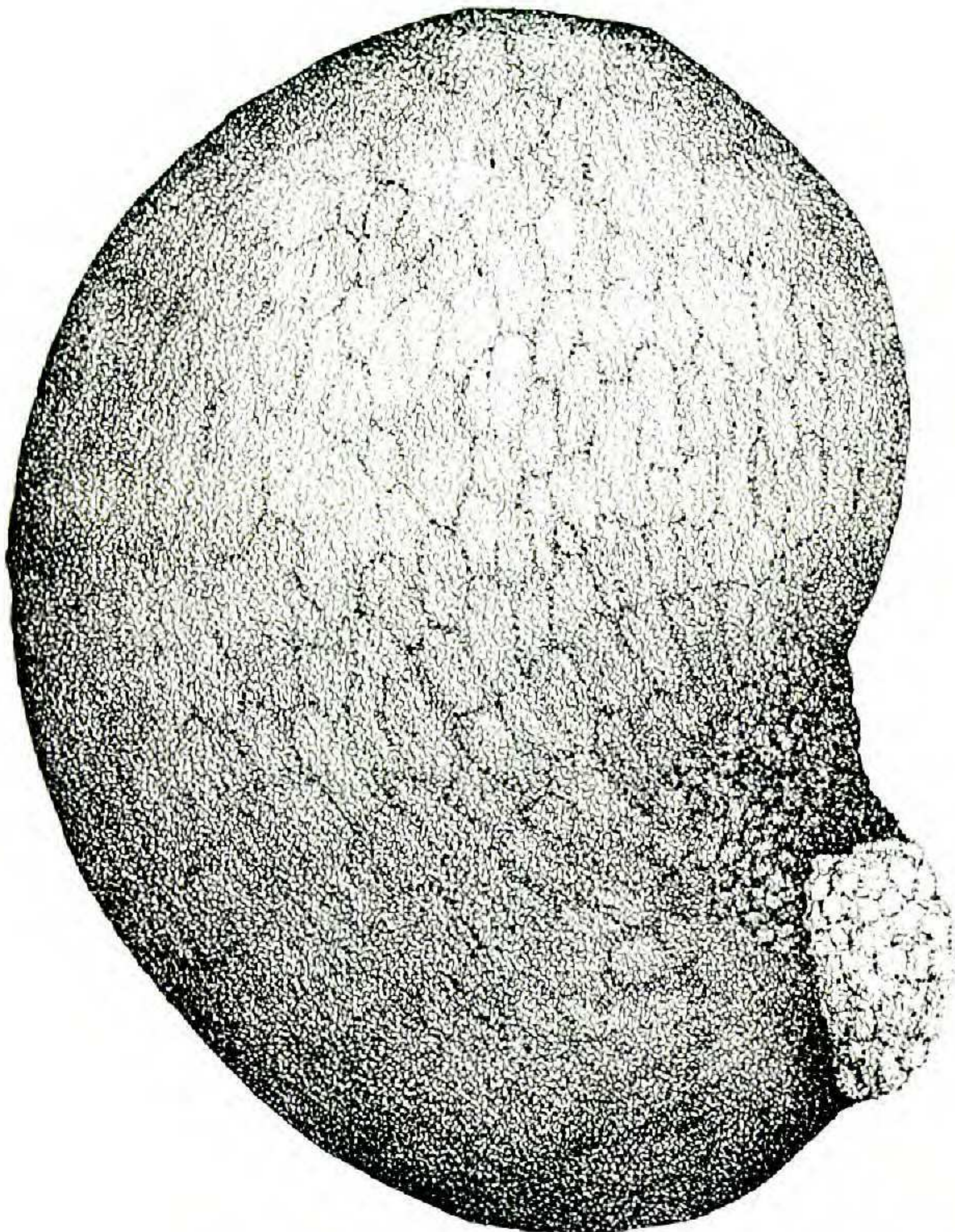
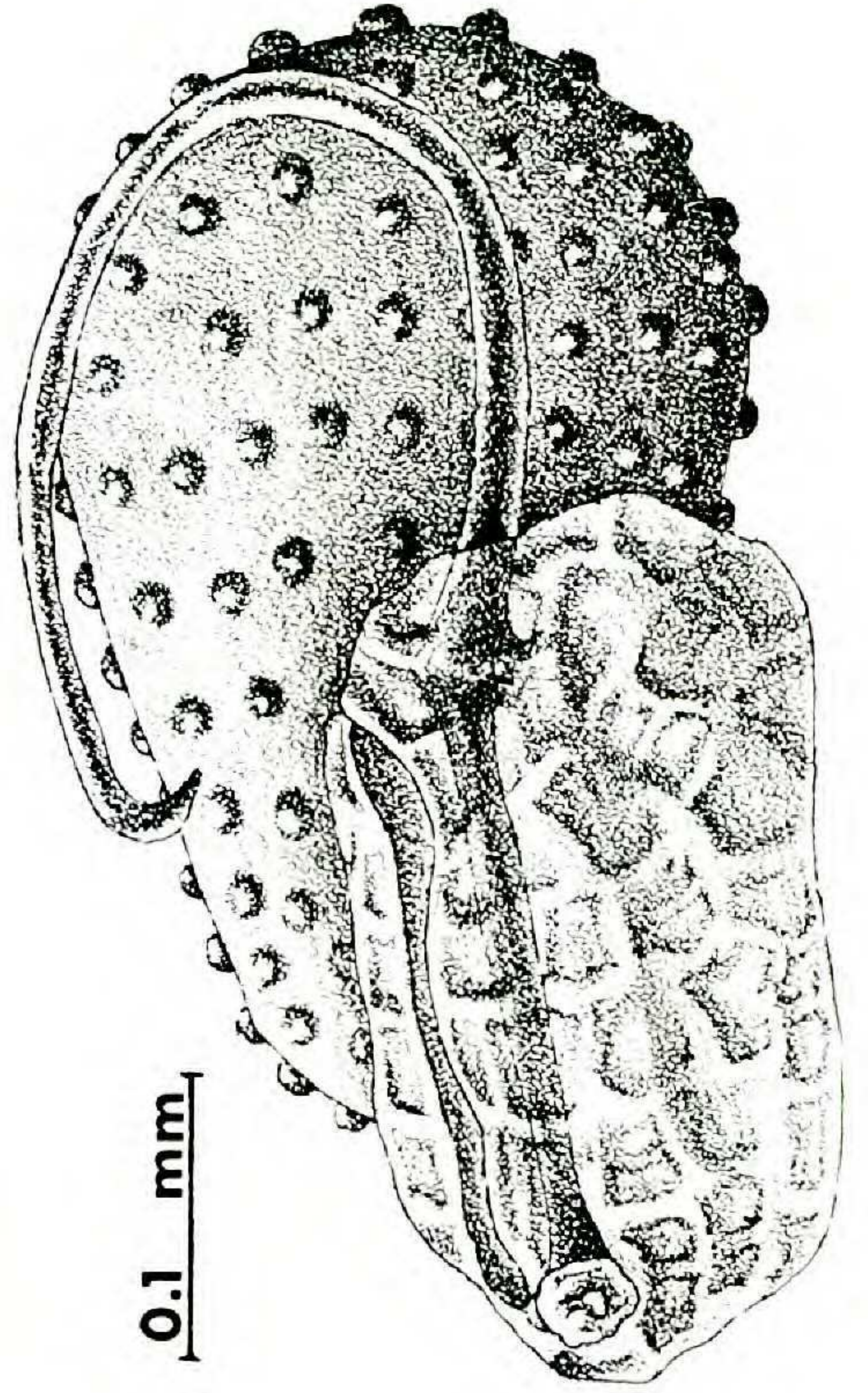
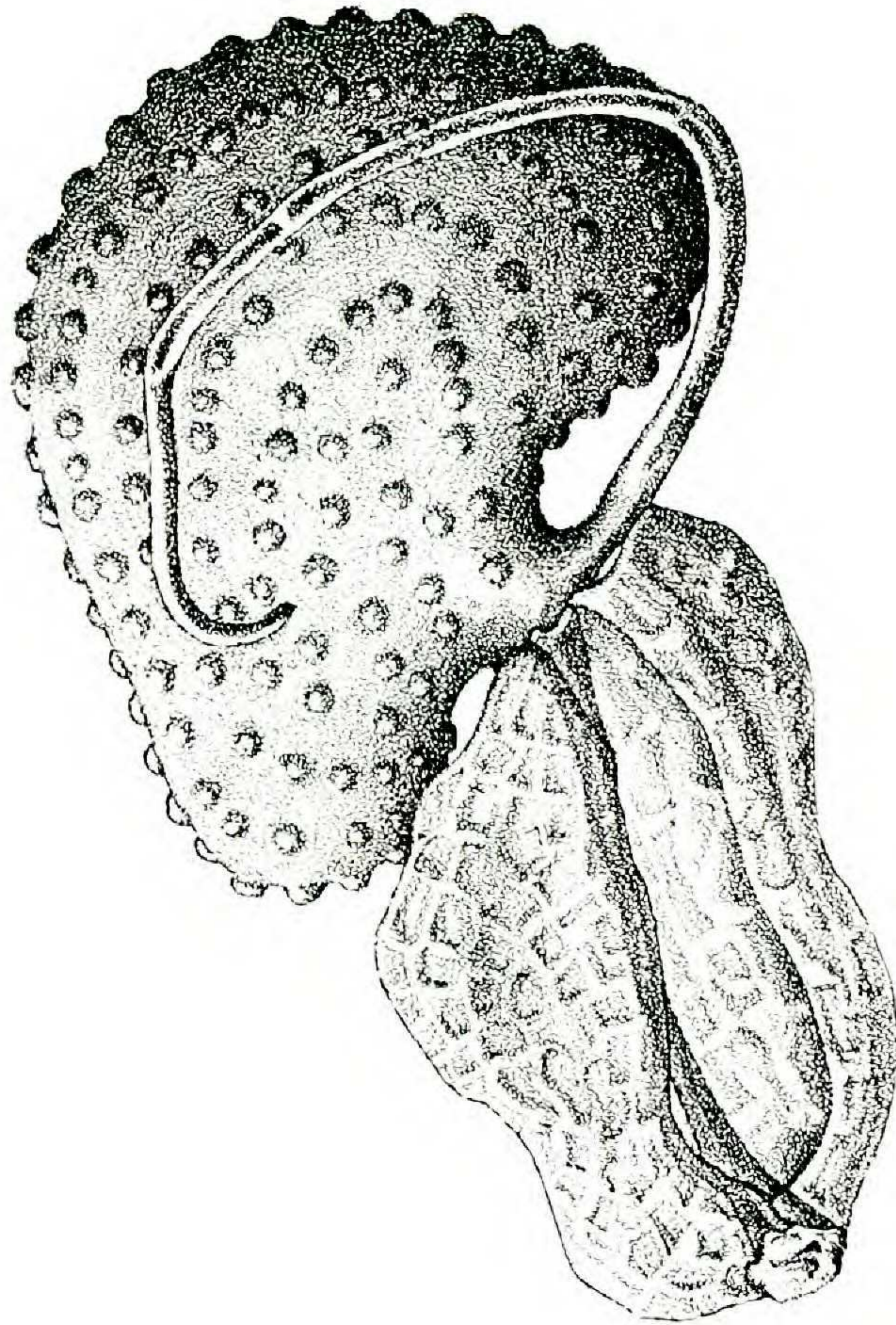


Fig. 3. *Glinus lotoides* (top), *Cypselea humifusa* (bottom).

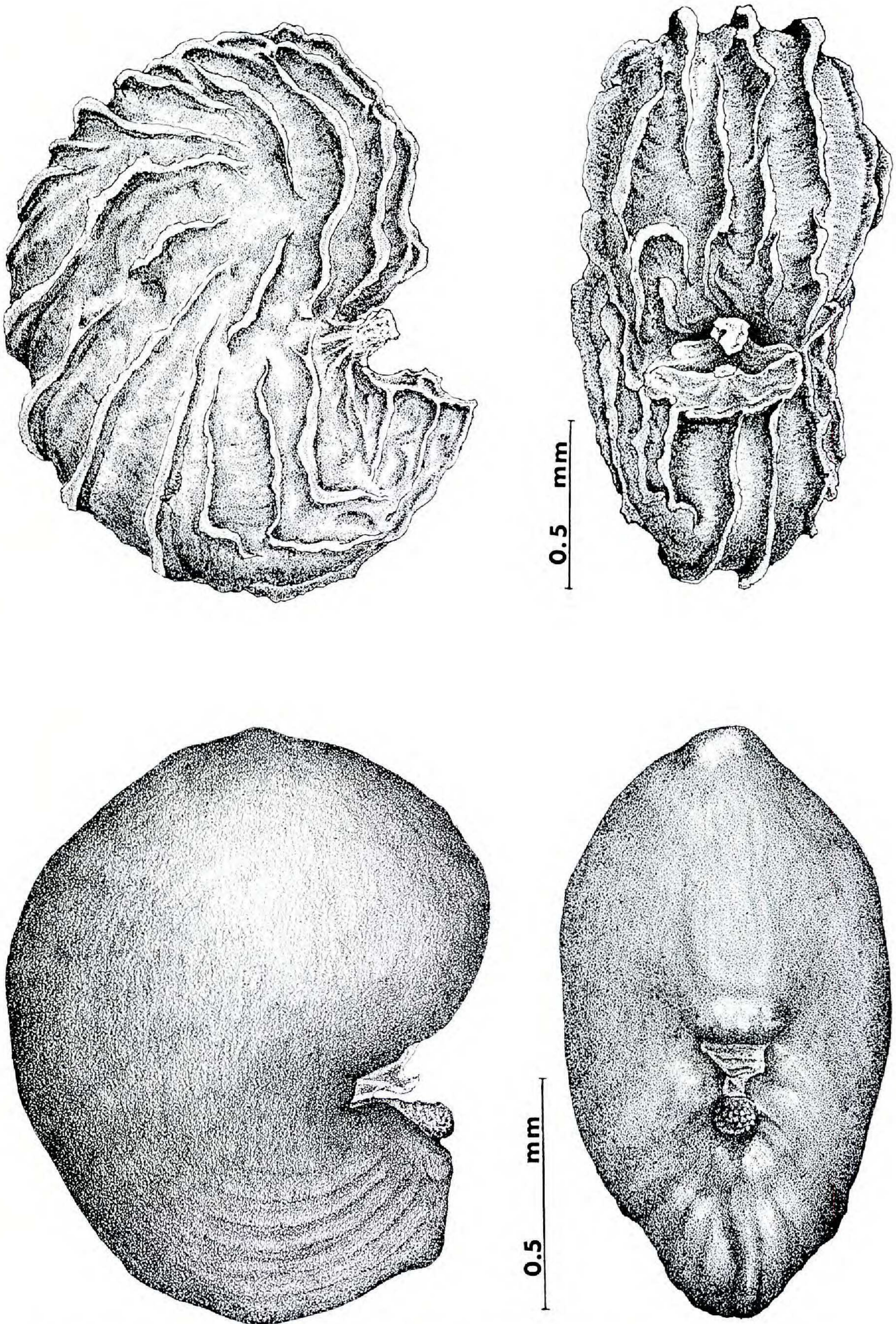


Fig. 4. *Trianthema portulacastrum* (top), *Sesuvium portulacastrum* (bottom).

smooth to irregularly punctulate, sometimes with very faint, low, rounded ridges in the hilar quarter of the seed; hilar depression prominent; hilar peg usually present, whitish to brownish.

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